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Early Paleozoic zircon ages from the Namche Migmatites of the Higher Himalayan Zone

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The Himalayan orogeny is caused by the Cenozoic collision of the Indian plate against Eurasia. However, several lines of evidence in stratigraphy, magmatism and metamorphism supporting that the proto-Himalayan belt has suffered some orogenic events during the early Paleozoic in the northern margin of East Gondwana have been pointed out by several authors (e.g., Valdia, 1995; Marquer, et al., 2000; Gehrels et al., 2003; Yoshida and Upreti, 2006; Cawood et al., 2007).

We conducted a preliminary geochronological study on two leucosome samples from the Namche Migmatites of the Higher Himalayan Gneisses, and obtained the first direct age data of high-grade metamorphism in the Himalayan belt. The Higher Himalayan Gneisses (also called the Higher Himalayan Crystalline Sequence) in the Everest area is composed of the Barun Gneiss, Namche Migmatites (also called the Namche Migmatite Orthogneiss), Romgbuk Formation (also called the Black Gneiss) and North Col Formation from south to north, i.e., from structurally lower to the upper. Among these the Namche Migmatites is the typical staff of the Higher Himalayan Gneisses, occupying its central zone and totally showing medium- to high-grade (c 700°C and 5 Kb) metamorphism and migmatization.

Two samples from the Namche Migmatites, sample No. 07EVT31 from the less-migmatitic biotite gneiss in the south, and sample No. U1206 from highly migmatized sillimanite biotite gneiss in the north of the Migmatites were analyzed. U-Pb geochronology of zircons were conducted by laser ablation-multicollector-inductively coupled plasma-mass spectrometry (LA-MC-ICP-MS) at the University of Arizona, Tucson (Fig s . 1,2).

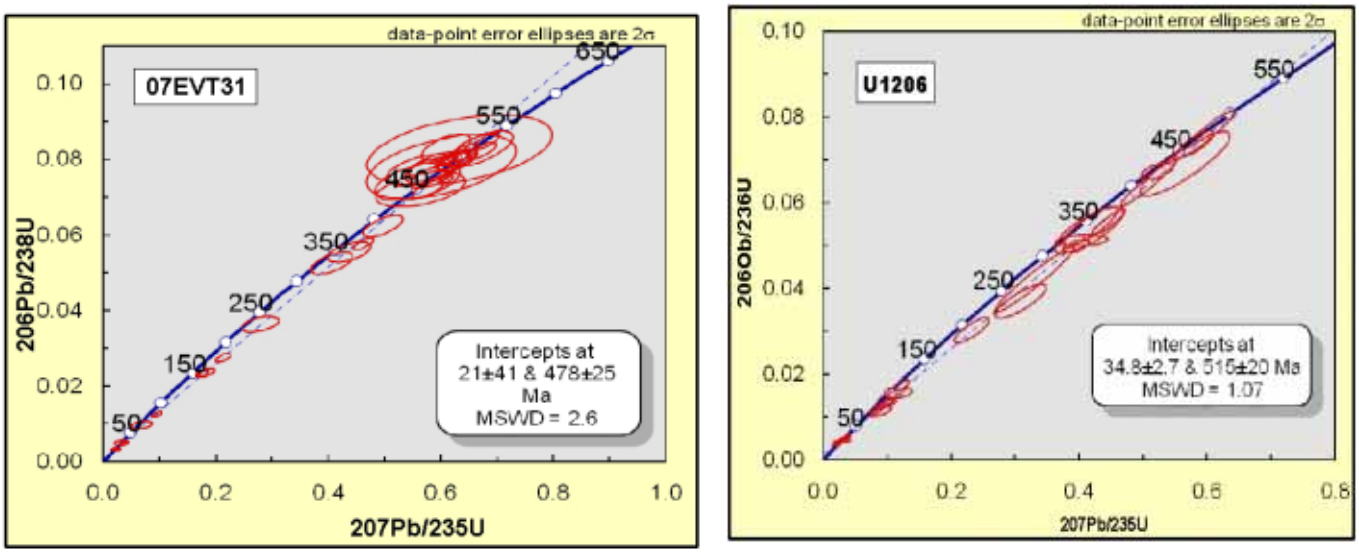

Fig. 1 Pb/U Concordia-discordia diagram of 07EVT31 for samples 07EVT31 (left) and U1206 (right)

Analyses of zircons from Sample 07EVT31 are aligned on a discordia with upper and lower intercepts at 478±25 and 21±41 Ma, and a concordant ages of 478±25 and 20.9±1.2 Ma from cores and rims respectively were obtained. Analyses of zircons from sample U1206 show a discordia with upper and lower intercepts at 515±20 and 34.8±2.7 Ma, and concordant ages of 515±20 and 24.8±0.5 Ma from cores and rims respectively were obtained. The high U/Th ratio (Fig. 2) found in the young Tertiary as well as the Lower Paleozoic zircons suggests that they grew in the presence of abundant metamorphic fluids.

The above results clearly point out that considerable part of zircon grains in both analyzed samples initially crystallized during the early Paleozoic time. The occurrence of zircons within leucosomes of gneisses indicates that the zircon formation should have been in accordance with the formation of these leucosomes, thus reflecting the high-grade metamorphism during the early Paleozoic time.

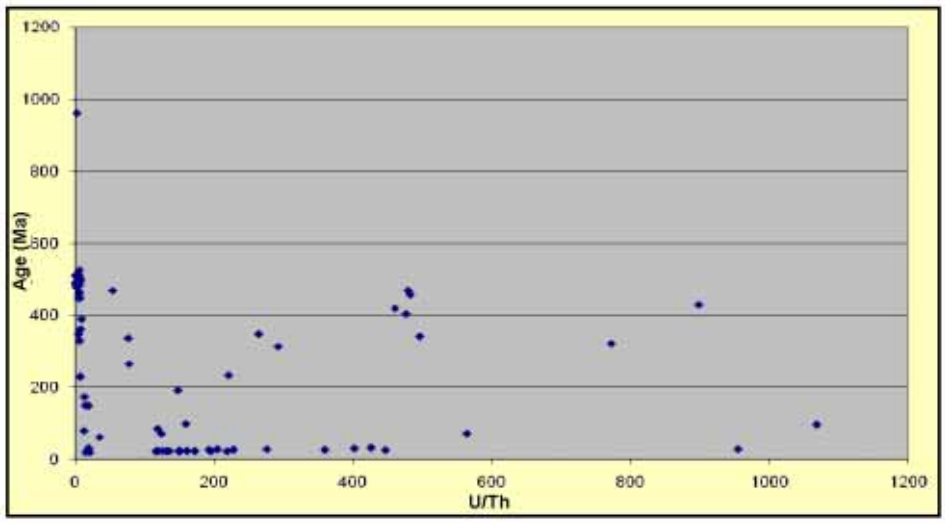

Figure 2. U/Th plot of the zircon samples

The conclusion derived from the present study collaborates with earlier studies which also pointed out lines of evidence of early Paleozoic tectono-metamorphic events in the Proto-Himalayan belt, to examine tectonic conditions of the Gondwanan northern margin during the early Paleozoic times (e.g., Cawood et al., 2007) in conjunction with a total figure of Pan-African orogenesis in Gondwanaland.

References

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